MINE FALLS RESTORATION PROJECT

Quality Assurance Project Plan

NASHUA REGIONAL PLANNING COMMISSION

May 23, 2000

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Warren Howard _____
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Arthur Clark _____
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A 3 Distribution List

1. Mine Falls Park Advisory Committee, Volunteer Monitors
2. Nashua River Watershed Association (NRWA), Volunteer Monitors
3. Rick Seymour, Superintendent, Nashua Waste Water Treatment Plant
4. Pat Bickford, New Hampshire Department of Environmental Services (NHDES) Lab
5. Stephanie Bowser, Program Coordinator, (NHDES) Volunteer Lakes Assessment Program (VLAP)
6. Jody Connor, NHDES Limnology Center Director
7. Betsy Hahn and Julie Cummings, Project Managers, Nashua Regional Planning Commission (NRPC)
8. Steve Couture, Project QA Officer, NHDES Watershed Bureau (Biology Section)
9. Warren Howard, Project Manager, US Environmental Protection Agency
10. Joanne King, Field Coordinator for Souhegan and Merrimack Rivers
11. Steve Fitzgerald, Nashua High School Environmental Science Teacher

A 4 Project/Task Organization

The *Mill Pond Restoration Project* requires the participation of a number of partners. The two major partners are the City of Nashua and the Nashua Regional Planning Commission. Stephanie Bowser, NHDES VLAP Coordinator (603-271-2658) has the overall responsibility for training volunteer monitors. Joanne King, Field Coordinator (603-424-5807) will coordinate with monitors, deliver samples to the labs, coordinate lab results with NHDES QA Officer and NRPC, and assist with the final report. The Mine Falls Advisory Committee, Nashua High School science students, and NRWA volunteers will do the sampling. The NRPC (603-883-0366) will be responsible for the final report and information coordination with Steve Couture (603-271-8801), the NHDES Project QA Officer. Steve Couture is responsible for coordination with the USEPA Project Manager Warren Howard.

A 5 Problem Definition/Background

The *Mill Pond Restoration Project* proposes to assess water quality by analyzing the nonpoint sources of pollution impacting the water quality of the Mill Pond and the Nashua River Canal. Both the Mill Pond and the Canal have experienced increased growth of aquatic vegetation in the past few years. In 1998, the NH Department of Environmental Services (DES) as part of the Lake Monitoring for Trophic Classification program sampled the Mill Pond. The sampling was conducted on July 21, 1998, and documented extremely dense growths of coontail and milfoil, and indicated that algal mats covered 40 percent of the Mill Pond. Water quality analysis indicated total phosphorous levels of .046 and .098 mg/l, at 2.5 and 5 meters respectively, clearly above the recommended level of concern of 0.01 mg/l**.** The survey also noted that Mill Pond receives large volumes of urban runoff from parking lots and other impervious areas in the watershed. No dissolved oxygen was found below 12 feet in the 22 foot Mill Pond. The proposed project seeks to identify the nonpoint source impacts to the Mill Pond from watershed land uses and stormwater discharges. The following activities are proposed as part of this project.

A 6 Project/Task Description

A volunteer water quality monitoring program will be established with assistance from the NHDES -VLAP, the NRWA and the NRPC. Six fixed stations will be set up on the Nashua River, in the Mill Pond and in the Canal. The proposal is to monitor these sites bi-weekly, June through September, for dissolved oxygen, total phosphorous, e-coli, pH, conductivity, and turbidity. Chlorophyll-A and acid neutralizing capacity analysis will be conducted only on the Mill Pond samples. In addition to the fixed sites, wet weather sampling will be conducted at the nine stormwater outfalls to the Mill Pond once in the spring, summer and fall. The samples will be analyzed for total phosphorous, pH, e-coli, turbidity, conductivity, and total suspended solids. The VLAP staff will train monitors. The proposed monitoring program will utilize volunteers, students from Nashua High School and the Mine Falls Park Advisory Committee to collect samples. The program will build on a monitoring program currently underway by the students at Nashua High School.

Eleven parameters were chosen for this project based on the drinking water standards and the following rationale:

1. *E. coli* – The Parks regular visitors include dogs, and waterfowl;
2. Dissolve Oxygen (DO) - No DO found below 12 feet in the previous study;
3. PH-To determine if the growth and reproduction of fish and other aquatic organisms is a problem;
4. Total Suspended Solids (TSS) - Mill Pond receives large volumes of urban runoff from parking lots and other impervious areas in the watershed;
5. Conductivity -- To determine if salted roads and urban runoff is a significant problem;
6. Turbidity - To determine clarity and how much suspended matter is in the water;
7. Chlorophyll A - Indicator of algae abundance;
8. Alkalinity - Ability of this water body to neutralize acidic input;
9. Total Phosphorous - Identified problem in previous studies and is the limiting nutrient which algae utilize to maintain their growth and reproduction;
10. Temperature – To be used as a contributing factor with other parameters i.e. phosphorous and increased algal blooms.

Project Schedule

The project will proceed on the following schedule:

1. Develop QAPP – January-May 2000
2. Train Volunteers – May 2000
3. Sampling – May- September 2000
4. Write final report – November 2000

A 7 Acceptance Criteria

Parameters	Desired Precision	Accuracy	Method Detection Limit
Nashua Wastewater			
E. coli	Follow NHDES Guidelines-see Appendix D	Follow NHDES Guidelines-see Appendix D	1 cfu
DO	Follow NHDES Guidelines-see Appendix D	Follow NHDES Guidelines-see Appendix D	0.1 mg/L
Total Suspended Solids	Follow NHDES Guidelines-see Appendix D	Follow NHDES Guidelines-see Appendix D	1 mg/L
NHDES Limnology Center			
Conductivity	± 2.00 µS/cm (0-<50 µS/cm Range) ± 5.00 µS/cm (50-<100 µS/cm Range) ± 10.00 µS/cm (100-<500 µS/cm Range)	N/A	10 µS/cm
Turbidity	± 0.32 NTU (0-1.99 NTU Range) ± 0.76 NTU (2.0->19.9 NTU Range) ± 5 NTU (20->200 NTU Range)	N/A	1.00 NTU
Chlorophyll A	± 1.50 mg/m^3 (0-5 mg/m^3 Range) ± 2.97 mg/m^3 (5.1->10 mg/m^3 Range)	N/A	2 mg/m^3
Alkalinity	± 1.50 mg/L as CaCO (0-5 mg/L Range)	N/A	2 mg/L as CaCO
pH	± 0.51 pH Units	N/A	3.5 pH Units
NHDES Lab			
Total Phosphorous	Lab duplicate range 0.006mg/L	0.100 mg/L * 10%	.003
DO-Meter	*10% mg/L & **5% % Air Saturation (0-5C)** *5% mg/L & **2.5% % Air Saturation (5.1-45**C)	N/A	0.5 mg/L & 5% Air Saturation
Dissolved Oxygen	± 10% mg/L & ± 5% %Air Saturation (0-5°C) ± 5% mg/L & ± 2.5% %Air Saturation (5.1-45°C)	N/A	0.5 mg/L & 5% Air Saturation

A 8 Special Training/Certification

Volunteer monitors will be required to attend a field sampling training session prior to the commencement of this assessment project. The field training session that will introduce the volunteers to NHVLAP standard operating procedures and techniques and include mock collection runs to verify sampling competency. The NHVLAP Program Coordinator will conduct the training session.

Steve Couture, Project QA Officer, or his designee will assist during the June monitoring events to ensure proper procedure and techniques are being followed. The QA Officer assistance during the initial sampling efforts will serve as refresher training for the volunteers.

B 2 Sampling Procedures

Six fixed sampling stations will be set up on the Nashua River, in the Mill Pond, and in the Nashua River Canal. These sites will be monitored bi-weekly, June through September, for *E. coli*, DO, pH, conductivity, turbidity, Chlorophyll-A (Mill Pond only), and Alkalinity (Mill Pond only). Volunteers will measure temperature in the field and duplicate samples will be collected and recorded. DO meter measurements will only be taken at the surface and at one meter intervals at the Mill Pond fixed station. The field calibration and analysis of DO will be in accordance with the manufacture's instructions (Appendix A). All sampling will follow VLAP standard operating procedures for in-lake and tributary sampling techniques (See Appendix B). The samples will be fixed in the field and stored on ice in a cooler until delivery to the laboratories. Samples must be delivered to the laboratory within 6 hours of collection in order to meet the hold time for the bacteria samples. Samples will not be collected if the hold time can not be met or if the lab is closed.

Fixed Monitoring Locations (See Map 1):

Station #1 –Above the dam on the Nashua River
Station #2 – Mill Pond at 2.5 meters
Station #3 – Mill Pond at 5.0 meters
Station #4 – Beginning of the Nashua River Canal
Station #5 –Nashua River Canal at Whipple Street
Station #6 – Nashua River Canal at Pine Street

Wet Weather Sampling:

Wet weather sampling will be performed to characterize the contaminant contribution from the nine stormwater outfalls to the Mill Pond once in the spring, summer, and fall. The samples will be analyzed for *E. coli*, pH, total suspended solids, conductivity, turbidity, and total phosphorous. Sampling will only be conducted when preceded by 72 hours of dry weather and are predicted to have at least 0.3 inches of rainfall. Samples will be taken during the "first flush", i.e., the first half-hour of the precipitation event. Water samples will be collected in laboratory–supplied containers by placing the head of the bottle at the end of the culvert/pipe discharge until full. (See Appendix B). Record will be kept documenting the following:

1. Date the rainfall event started
2. Time the rainfall event started
3. Time the rainfall event ended
4. Total amount of the rainfall event in inches
5. Previous rainfall event date and the amount
6. Flows at the time of sampling

B 3 Chain of Custody

A chain-of-custody form provided by the laboratories will be filled out each time a sample is collected with the following information:

1. Sample station number, sample identification and location
2. Date and time the sample was collected
3. Sample type: Grab
4. Sample matrix: Water
5. Number of containers turned into the lab
6. Preservative used in each container
7. The analysis requested
8. Sampler name and signature
9. Date and time the samples were dropped off at the lab

Field Sampling Table

Parameter	Sample Matrix/ Collection Method	# Samples (includes duplicates)	Sample Volume	Sample Container	Preservation Method	Max. Holding Time
Nashua Wastewater						
E. coli	Water/Grab	74	100 ml	Plastic or glass	4C	6hrs.
Total Suspended Solids	Water/Grab	30	100 ml	Plastic or glass	4C	7 days
NHDES Limnology Center						
Conductivity	Water/Grab	80	1000 ml	Polyethylene, Clear	Cool, 4 C	24 Hrs
Turbidity	Water/Grab	80	1000 ml	Polyethylene, Clear	Cool, 4 C	24 hrs
Chlorophyll A	Water/Composite	11	500 ml	Polyethylene, Dark	Cool, 4 C, In Dark	24 Hrs
Alkalinity	Water/Grab	11	1000 ml	Polyethylene, Clear	Cool, 4 C	24 Hrs
pH	Water/Grab	80	1000 ml	Polyethylene, Clear	Cool, 4 C	Immediate
NHDES Lab						
Total Phosphorous	Water/Grab	80	250 ml	HDPE-brown	Cold, 4 C H2SO4 to pH < 2	28 days
DO Meter						
Dissolved Oxygen	YSI Model 52	59	N/A	N/A	N/A	Immediate

B4 Analytic Procedures

Analytic	*Matrix*	*Analytical Method*
Nashua Wastewater		
E. coli	Water	EPA 1103.1, 0222 Standard Methods 19th Edition
DO	Water	YSI Model 52
TSS	Water	EPA 160.2
NHDES Limnology Center		
Conductivity	Water	2510B Standard Methods 20th Ed. 1998
Turbidity	Water	2130B Standard Methods 20th Ed. 1998
Chlorophyll A	Water	10200H Standard Methods 20th Ed. 1998
Alkalinity	Water	2320B Standard Methods 20th Ed. 1998
pH	Water	2310B Standard Methods 20th Ed. 1998
NHDES Lab		
Total Phosphorus	Water	EPA 365.2

B 5 Quality Control Samples

Analyses	Lab Duplicates	Spiked Samples	Trip Blanks	Lab Blanks	Field Duplicates
Nashua Wastewater					
DO					
E. coli	*				5
TSS	*				3
NHDES Limnology Center					
Conductivity	10%	No	No	No	5
Turbidity	10%	No	No	Yes	5
Chlorophyll A	10%	No	No	Yes-1/batch	3
Alkalinity	10%	No	No	No	3
pH	10%	No	No	No	5
NHDES Lab					
Total Phosphorus	1 of 10	1of 10	NA	Yes-1/batch	5
Dissolved Oxygen Meter					
Dissolved Oxygen					3

***Follow guidelines per New Hampshire State Certification Program #102699-A (Appendix C)**

Field duplicates will be taken at a minimum of one station during the initial three non-wet weather sampling events to assist in the evaluation of the volunteer monitoring collection efforts. The other two field duplicates will be utilized at the discretion of the project QA officer.

B 6 Equipment Testing, Inspection and Maintenance

The YSI 52 Dissolved Oxygen Meter probe membrane will be inspected for air bubbles prior to field use. All other testing, maintenance, and inspection of the meter will be in accordance with the manufacturer's instruction manual (Appendix A).

B 7 Instrument/Equipment Calibration and Frequency

The Instrument Calibration information for the DES Laboratory is on file with EPA. The Nashua Waste Water Treatment Plant Instrument Calibration information is can be found in Appendix D. The YSI 52 Dissolved Oxygen Meter will be calibrated daily in accordance with the manufacturer's instructions (Appendix A). The Limnology Center Instrument Calibration information can be found in Appendix C. In addition, when samples from this project are analyzed at the Limnology Center, calibration verifications will be performed on the pH, Turbidity, and Conductivity meters after the last project sample has been analyzed. If the calibration verifications show unacceptable calibration drift, all samples since the last calibration check should be reanalyzed. The calibration verification standard for the pH, Turbidity, and Conductivity meters shall be 6.00 pH units, 1.0 NTUs, and 100 μS/cm respectively.

C 1 Assessments

Joanne King, Field Coordinator for the Souhegan and Lower Merrimack River, will serve as Field Coordinator on this project. She has extensive water quality sampling experience. She will help coordinate scheduling volunteers, be responsible for the deliveries to labs in the proper time frames, and perform on-site assessments early in the monitoring season to assure proper procedures are being followed. She will collect and analyze the data from the labs. This data will then be forwarded to Steve Couture, the Project QA Officer and NRPC for review.

D 1 Data Quality Requirements

Data Representatives: These sampling stations will accurately represent the water quality of the Mill Pond and Canal and stormwater discharges into the Mill Pond. Duplicate samples will be collected at a rate of approximately 10 percent of the samples collected to ensure the integrity of the data.

Documentation, Data Reduction and Reporting: Chain-of-custody documentation will be maintained. Data sheets will be reviewed for completeness and for holding times by the Field Coordinator.

Corrective Action: When it is found that the data is incomplete or that the results are unacceptable, the Project QA Officer may determine that one or more of the following procedures for corrective action shall be undertaken.

1. Incomplete data – Omissions on worksheets place the entire analysis in question. Incomplete sampling may require re-sampling at the fixed sites or waiting till another storm event. Incomplete lab data usually calls for reintroduction or reanalysis of the questionable sample if possible.

2. Conflicting data – Conflicting data may require the entire analytical performance be questioned or a site investigation to determine if other variables are influencing the results. The Project QA Officer may require re-sampling or waiting till storm event or reanalysis if possible.

3. Poor performance – When results from duplicates fall outside of the acceptable ranges, the Project Officer will review the available data and discuss the problem with the appropriate lab. The final decisions on data review and acceptance rest with the Project QA Officer. Upon examination, all or some for the following actions may be applied:

    A. Field Coordinator will examine the volunteers sampling technique.
    B. Determination of matrix interference.
    C. Reconsider the acceptable limits and include a statement explaining the action/rationale taken.
    D. Rejection of data and exclusion from the report with a written explanation.
    E. Rejection of the entire sample/site location with recommendation of relocation of sample site or reconsideration of results sought.

#500M-13

Appendix A

Manufactures' Instructions for Field Calibration for DO Meter

Appendix B

New Hampshire Volunteer Lake Assessment Program
Standard Operating Procedures for Sampling

Appendix C

New Hampshire Department of Environmental Services
Limnology Center Lab Quality Assurance

Appendix D

Nashua Wastewater Treatment Plant
Lab Quality Assurance

Appendix E

For description of protocols for determining detection limits, accuracy, and precision, see NHDES Laboratory Services Unit Standard Operating Procedures (SOP's) on file with EPA